Can You Imagine . . .

. . . a tracking system that can tell in what direction and at what depth the eye is focusing.

3-D EYE TRACKING TO AID VIRTUAL ENVIRONMENTS TECHNOLOGY

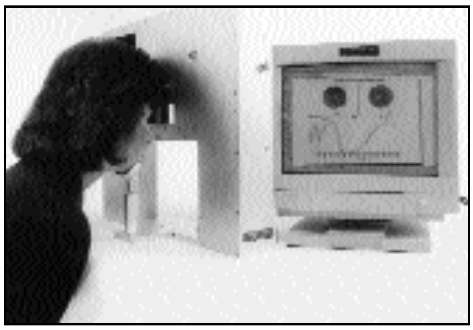
Projecting images where the user's eyes look, and not just where the head points, creates a more realistic virtual environment for flight simulators, virtual reality (VR) displays, and helmet-mounted displays. This function requires new technology to track the eyes' movements and focusing distances in real time. The new ocular information would enable computers to precisely locate where the user looks. It also would allow the computers to project low-resolution images in areas where the user's eyes are not focused, saving valuable computer time.

Applied Modern Technologies Corporation (AMT; Huntington Beach, CA) developed a real-time device that tracks critical eye movements and measures important physical characteristics of the eye. The next generation of VR displays and telemedicine systems could incorporate this device, which is called OVAS® (short for ocular vergence and accommodation sensor). OVAS is derived from BMDO-funded research and development in adaptive optics.

AMT MARKETS A VERSION OF OVAS® SUITABLE FOR USE IN AN OFFICE OR LABORATORY.

AMT's technology could significantly improve VR displays. Feeding viewer sight information to image generators, OVAS could reduce the cost of VR displays, since computer resources will not be spent generating images in areas outside the viewer's focus. Because it can help image generators to precisely position the virtual scene before the viewer's eyes, OVAS could also increase the sophistication of VR displays.

AMT markets a version of OVAS for VR suitable for use in an office or laboratory. Currently housed in a box that fits on a tabletop, OVAS weighs approximately 10 pounds. It could be miniaturized to 20 grams per eye, with a size approximately 1 x 6 inches for helmet-mounted displays or goggle applications. Because OVAS takes readings from up to four feet away from the subject, AMT envisions application in VR theaters, rides, or games.



■ AMT's OVAS® projects near-infrared light on the retinas to tell where the eyes are focused.

As part of a telemedicine system, OVAS could help doctors diagnose ophthalmic conditions in patients located miles away. AMT plans to build a telemedicine system that incorporates OVAS technology under a proposal to the U.S. Army Medical Research and Material Command. Other research participants include Multimedia Medical Systems, the University of Washington, and the University of Southern California's School of Ophthalmology. In addition, AMT has obtained a two-year grant from the American Health Foundation to apply OVAS in the diagnosis of Alzheimer's disease. Other applications may include ophthalmic research and corneal surgery. AMT will soon seek FDA approval for OVAS.

ABOUT THE TECHNOLOGY

OVAS measures the ocular foci and vergence—or inward pointing of the eyes—faster than the eyes can respond. It also measures pupil size in real time. Using two low-power, near-infrared lasers operating at a wavelength of 840 nanometers, OVAS bounces light off the retina of each eye and through a set of optics. The spectral reflection provides wavefronts of very short spatial coherence length. A wavefront-sensing technique originally developed for BMDO-funded adaptive optics research characterizes the wavefronts. A desktop computer processes this information to extract the refractive power of the ocular system from the wavefronts. OVAS currently operates at data rates between 0.5 and 10 Hertz.